



FOREST PEST MANAGEMENT

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BIOLOGICAL EVALUATION OF MARION MOUNTAIN, FERN BASIN AND BOULDER BASIN CAMPGROUNDS, SAN JACINTO RANGER DISTRICT, SAN BERNARDINO NATIONAL FOREST

Dave Schultz, Entomologist
Gregg DeNitto, Plant Pathologist

ABSTRACT

Three campgrounds on the San Jacinto Ranger District were evaluated for pest problems. The major problems noted at Marion Mountain campground are overstocking and annosus root disease in white fir and pines. Minor pests include sugar pine dwarf mistletoe and true mistletoes in incense-cedar, white fir and live oak. Overstocking is also a major problem at Fern Basin Campground. Annosus root disease is present in pine and white fir and has the potential to cause mortality or hazardous trees. True mistletoes on incense-cedar, white fir and live oak are contributing to the stress on campground trees. Western dwarf mistletoe on ponderosa pine is just beginning to enter the campground. Stocking levels in parts of Boulder Basin Campground are probably excessive for that fragile site. Annosus root disease is common in white fir and is causing some tree decline. True mistletoe is adding to the stress on white fir. Red-brown butt rot is common in overstory pines and may contribute to hazardous conditions.

Management alternatives for the major problems in each campground are presented. The action alternatives for each campground are not mutually exclusive. Pest management alternatives could be integrated into a vegetation management plan for each campground.

INTRODUCTION

At the request of Charles Irby, Acting Forest Supervisor, we examined Marion Mountain, Fern Basin and Boulder Basin Campgrounds on November 1, 1984. We were accompanied by Heber Williams, District Recreation Officer.

MARION MOUNTAIN CAMPGROUND

The campground is located at about 6,500 feet elevation. There are two adjacent loops with a total of 24 units. The area contains a diversity of tree species and size classes. The overstory trees are primarily Jeffrey or ponderosa pines with a few sugar pine and incense-cedar. Many are over 30 inches dbh and are showing signs of overmaturity. The understory contains white fir, incense-cedar, sugar pine, Jeffrey pine, live oak, black oak and a few Coulter pine. There are a few clumps of whitethorn in the campground.

OBSERVATIONS AND DISCUSSION

Individual pest problems are indicated on the enclosed campground map. Much of the vegetative condition of the campground is related to white fir seeding into the understory over a period of years. Some of the old-growth pines are surrounded by thickets of sapling and pole-size white fir and incense-cedar. The shade tolerant understory competes with the overstory for water and can contribute to the decline of an older tree. The same process is happening as conifers are growing up through the crowns of some oak trees in the campground. If the conifers begin to shade out the oak, the oak may decline and the slow growth and dieback can produce hazardous limbs before it finally dies. The large number of white fir stumps in the campground indicates that while it is native to the site, white fir is not very hardy under these campground conditions.

Many of the white fir stumps contained conks of Fomes annosus. In some cases, annosus was associated with poorly growing or recently dead white fir, although there was no effect around some stumps because there were no living firs nearby. Annosus root disease infections in true firs tend to spread to other true firs through root contact, but will generally not cross to other species. The disease acts primarily as a root and butt rot in true firs. There may be little effect on the tree, other than a loss of volume, as long as the tree is adding wood and roots faster than they are being decayed. If the tree slows down in growth, the loss of wood and roots may cause the fir to become hazardous, or during a period of moisture stress it may be more susceptible to the fir engraver, Scolytus ventralis.

Conks of Fomes annosus were also found in 5 pine stumps in the campground. Although the disease can cause mortality in all conifer species when spreading from a pine stump, none of these infections was currently affecting any living trees. Many of the pine stumps were massive and it may be that the entire root systems aren't infected yet. It is also possible that other conifer roots haven't contacted the infected pine roots yet or if they have, that the infection hasn't grown up to the root collar. Regardless of the reason for the current lack of activity around the infested stumps, it would probably be prudent to be aware of them as locations to avoid planting conifers in the near future.

Several disease organisms present in the campground can probably be regarded as curiosities rather than pests. One large sugar pine at the edge of the camp-limits is infected with sugar pine dwarf mistletoe, Arceuthobium californicum. With the passage of time, dwarf mistletoe could build up to the point where it may seriously impair the vigor of this single tree, which is somewhat isolated

from the rest of the campground. The only cause for concern about this infection is that sugar pine is seeding into the campground in places and these may become possible replacements for the overstory. The currently infected tree could serve as a source of dwarf mistletoe infection for the young sugar pine at some point in the future.

There are also three different species of true mistletoe, Phoradendron spp., in incense-cedar, white fir and live oak in the campground. Control of true mistletoe has rarely been attempted in campgrounds for several reasons. True mistletoe makes much of its own food and depends on the host for physical support and water. Unless there are a large number of plants in a declining tree, the water stress caused by the infection can often be offset by thinning to reduce the overall stress on the tree. There are several techniques which have been used on a limited basis to remove or kill true mistletoe plants, but even when successful, results tend to be relatively short-lived. True mistletoe is spread when birds feed on the berries and later deposit the seeds while perching in a tree. Because it is generally not feasible to control the birds which vector true mistletoe, most control is limited to the incidental pruning of a few branches or removal of heavily infected hosts.

MANAGEMENT ALTERNATIVES

1. Do Nothing. The number and condition of the large pine stumps in the campground indicates that the average loss over the past decade was about one overstory tree every two years. The rate of loss is likely to accelerate in the future as the basal area increases due to growth and seeding in of shade tolerant species. Pines and oaks will become less prominent due to competition and shading from white fir and incense-cedar. Hazardous trees and mortality at a fairly young age will become more common due to annosus root disease in white fir.

2. Thin. The vigor and longevity of trees in several situations in the campground could be improved by thinning. The lifespan of some old-growth pines could be extended by thinning around them to a fairly low basal area. A few of the older trees already have thin, weak crowns which indicate they may have additional problems which could prevent response to thinning. If there is a well established young tree of a suitable species adjacent to a declining overstory tree, the greatest long-term benefits might be obtained by removing the older tree to release the replacement as soon as possible.

Some of the oaks in the campground would benefit greatly if the young conifers growing up through their crowns were removed before they begin to shade out or physically interfere with the oaks. Oak management could become important in the future because they are resistant to annosus root disease, which is relatively common in the campground.

Thinning would also be beneficial in several areas densely stocked with white fir. Lowering the basal area should increase the production of wood and roots. This may offset the action of annosus root disease and keep some white fir from becoming hazardous or from being successfully attacked by the fir engraver. A reduction in the general level of stress brought about by thinning

could also partially compensate for the presence of true mistletoe, although it may be wise to discriminate against heavily infected individuals when trees are removed.

Stumps of all freshly cut conifers in the campground should be treated with borax (sodium tetraborate decahydrate, EPA Reg. No. 1624-94) to prevent infection by Fomes annosus (See FSM R-5 Suppl. No. 90, 2305 and 2331.33).

3. Plant screening sparingly. Some areas of the campground have little screening at the present. There appears to be little need for visual barriers because of the distance between most units and the orientation of parking spurs. The large number of stumps and thin crowns of some trees indicate long-term stress on the campground, so planting a lot of additional vegetation would probably be counterproductive. In much of the campground, there is sufficient regeneration to provide future replacement trees. If vegetative screening or pedestrian traffic control is absolutely necessary, small amounts of slow growing, compact hardwoods already present on the site, such as live oak and whitethorn, could be planted. The form and growth rate of these species will allow them to remain useful much longer than conifers and their roots can also form a barrier to the spread of annosus root disease between conifer roots.

FERN BASIN CAMPGROUND

Fern Basin Campground is located at 6,200 ft. elevation in an elongated basin which slopes gently toward the southwest. An intermittent stream runs through the campground. Site quality appears to become lower toward the southwest end of the campground. The overstory consists of ponderosa and Jeffrey pine, incense-cedar and sugar pine. There is an understory of white fir, sugar pine, incense-cedar, black oak, live oak, ponderosa pine, Jeffrey pine and manzanita.

OBSERVATIONS AND DISCUSSION

Specific locations of pests within the campground are noted on the enclosed map. The only pests currently causing mortality in the campground is the combination of Fomes annosus and Scolytus ventralis on white fir near unit 14. There are additional white fir stumps infected with annosus root disease near unit 14 and also near unit 2, but the disease is having no effect at the present. One of the reasons that some fir stumps infected by annosus root disease are having no effect is that white fir is relatively uncommon within the campground boundaries and no hosts are close enough to contact the infected roots. A similar situation exists with a pine stump infected with annosus root disease between units 10 and 12. Although annosus can spread from this stump to any conifer species which comes into root contact, it is not causing any current problems because it is located in a barren expanse of decomposed granite which supports only a single manzanita plant. Future problems could develop around the infected fir and pine stumps if the area around them is regenerated with natural or planted seedlings of a susceptible species.

There is a potential for considerable tree mortality in parts of the campground due to very dense stocking. The densest conifer stocking occurs in the upper, or northeast, end of the campground where the basal area ranges from over 400 to about 600 square feet per acre. Regardless of the site index or which

forest type this is considered, the area is very overstocked. The current stocking can not be carried indefinitely and unless there is intentional thinning, bark beetles will eventually kill some of the trees. Unfortunately, the beetles do not always remove the trees that are least desirable. Stocking levels in the remainder of the campground are lower, but still appear to be above the long-term carrying capacity of the site. A large proportion of the basal area in the lower portion of the campground is contributed by multiple-stemmed clumps of live oak. Many of the live oak clumps have some branch dieback. The dieback appears to be a response to water stress resulting from heavy stocking of live oak infected with true mistletoe (Phoradendron sp.) growing on a soil which has low water-holding capacity. Incense-cedar and white fir are infected with other species of true mistletoe. The true mistletoes are difficult to control because they are spread by birds, but sometimes the effect of mistletoe on the water balance of the host can be offset by thinning. The vigor of both hardwoods and conifers could be improved in the lower end of the campground by lowering the basal area. Some of the thinning could be accomplished by removing some of the individual stems in the live oak clumps. Discriminating against stems which already have dieback or mistletoe infections is likely to improve both health and appearance. In some cases where either all of the stems in a clump have serious problems, or in situations where screening is more important than shade, it may be best to cut all stems and manage the stump sprouts.

Dwarf mistletoe on ponderosa pine (Arceuthobium campylopodium) is just beginning to enter the campground between units 15 and 16. The current impact ranges from negligible to slight. Because dwarf mistletoe spreads rather slowly within a tree as well as a stand, treatment can be deferred for many years although the number of alternatives will decrease with time. Dwarf mistletoe could be eradicated in this limited area by removing a few infected pines in and adjacent to the campground. Because of the limited extent of the infestation, some of the most desirable trees might be pruned rather than removed. To be effective, all branches up to the highest infection plus two whorls beyond must be flush cut. If less than 30% live crown will remain after pruning, then the tree must be removed. Monitoring of this eradication effort must continue for at least six years following treatment, and additional treatments may be necessary. If one or more of the infected pines are too important to be removed and the above pruning guides cannot be followed, it should be possible to isolate this corner of the campground by a buffer strip of non-hosts. The species of dwarf mistletoe present will infect only ponderosa, Jeffrey, Coulter and knobcone pines. Other species found in the campground such as the oaks, white fir, incense-cedar and sugar pine can be used in a band, several trees deep, to form a barrier to the spread of dwarf mistletoe.

MANAGEMENT ALTERNATIVES

1. Do Nothing. Heavy conifer stocking in the northeast end of the campground will make the trees more susceptible to attack by bark beetles. At some point, which may coincide with dry weather, many trees will be killed during a single season. High basal areas of live oak in the southwest portion of the campground will stress the conifers present in the overstory and prevent the establishment of conifer reproduction. This area will continue to be dominated by live oak clumps in various stages of decline. Dwarf mistletoe will slowly invade the campground and reduce the vigor of the hard pines. Conifers which

seed in or are planted near the pine stump infected with annosus root disease will be killed. White fir regeneration near the fir stumps infected with annosus root disease might be killed or may survive and become hazardous due to the root and butt rot that develop.

2. Thin conifer aggregations. Lowering the basal area to more appropriate levels will reduce the chance of bark beetles causing sudden large losses. It will also allow some choices to be made about the future size, age and species composition in the area. Selective thinning in the southwest corner of the campground could accomplish some dwarf mistletoe control. Conifer stumps resulting from thinning should be treated with borax to prevent infection by F. annosus. Pine slash over 3 inches diameter should be removed from the site or treated to prevent breeding by pine engravers (Ida spp.) within six weeks of cutting.

3. Manage oaks. Judicious thinning or pruning of oaks could improve their health and appearance. In some cases it would also improve the vigor of associated conifers. Oaks can be managed to provide screening where appropriate. Management of oaks around any of the conifer stumps infected with F. annosus would be one way of avoiding conifer mortality and future hazardous trees, and it is the most feasible way of dealing with infected pine stumps.

BOULDER BASIN CAMPGROUND

This 34 unit campground is located in a saddle at about 7,300 ft. elevation. The soil is decomposed granite. The overstory is primarily ponderosa or Jeffrey pine with a few white fir and Coulter pine. The stand is fairly open with some holes in the canopy. Most of the overstory pine are flat topped from wind and snow crooks are common. There is a limited amount of hard pine, sugar pine and white fir regeneration, which tends to be clumped. There is little brush in the campground and a general lack of screening.

OBSERVATIONS AND DISCUSSION

Annosus root disease in white fir, caused by Fomes annosus, was relatively common in the campground. It was present in stumps across the road from unit 3, also beyond unit 5 and at unit 19. At unit 19 there are declining white fir nearby which are probably already infected with annosus root disease. Another pest of white fir present was white fir true mistletoe, Phoradendron bolleanum ssp. pauciflorum.

A ponderosa pine behind unit 3 has an old basal wound and fruiting bodies of Phaeolus (Polyporus) schweinitzii. Many stumps of pines as well as some live pines have signs of red-brown butt rot (P. schweinitzii). Standing pines with advanced butt and root rot can become hazardous.

This site is rather fragile due to a thin soil with low water-holding capacity, lack of rain during the growing season, advanced age of the overstory, low species diversity and harsh weather conditions. Although the campground appears rather open, it may already be exceeding the long-term carrying capacity in places. Conditions outside the campground at comparable elevations appear to be similar. Basal scars on overstory pines indicate that periodic

ground fires have assisted in keeping the area open in the past. Recent fire control has allowed white fir to proliferate in the area. Most of the white fir regeneration is clustered in the shade surrounding the base of overstory pines with little regeneration of any kind in the stand openings. The regeneration is stressing the overstory trees, but is unlikely to provide suitable replacement trees when overstory trees die. Although white fir occurs naturally as a minor component of the stand, it is not as hardy on this site as the pines. White fir does not shut down transpiration as rapidly as the pines while undergoing water stress, which can be a disadvantage on a dry site. White fir in this area is also subject to two diseases which can affect the tree's water balance. True mistletoe makes much of its own food and is dependent on the host primarily for water. Small infections have a minor effect on the tree, however heavy infections in an older tree can make it more susceptible to mortality or top-killing caused by the fir engraver, Scolytus ventralis. Annosus root disease acts primarily as a root and butt decay in true fir rather than as an outright mortality agent. As a general rule, an annosus root disease infection in true fir is capable of infecting other firs by root contact, but will not spread to pines. Vigorously growing firs may add roots and wood faster than they are decayed while slowly growing trees do not and become progressively weaker. In addition to making the trees hazardous, the loss of roots can decrease the ability to absorb water. The impact on white fir of both true mistletoe and annosus root disease is more severe during periods of drought.

The life of many of the overstory trees could be prolonged if competition for water was reduced by thinning some of the understory. Because the pines are thriftier and have fewer pests than white fir on this site, it would seem reasonable to discriminate against white fir when thinning. Before actually marking any trees for removal, however, it may be prudent to check the pines for signs of red-brown butt rot which could make them hazardous. It should not affect the water balance of the overstory trees in the near future if some of the barren spots in the campground were planted with tree seedlings. Survival is likely to be low, but it will be difficult to perpetuate the stand without some sort of planting.

If screening is desired in parts of the campground, it would be desirable to use non-living things such as boulders or logs which would not compete with trees for soil moisture. If living screening is required within the campground, it may be necessary to plant a native species such as incense-cedar and periodically shear the tops to maintain them as hedges.

MANAGEMENT ALTERNATIVES

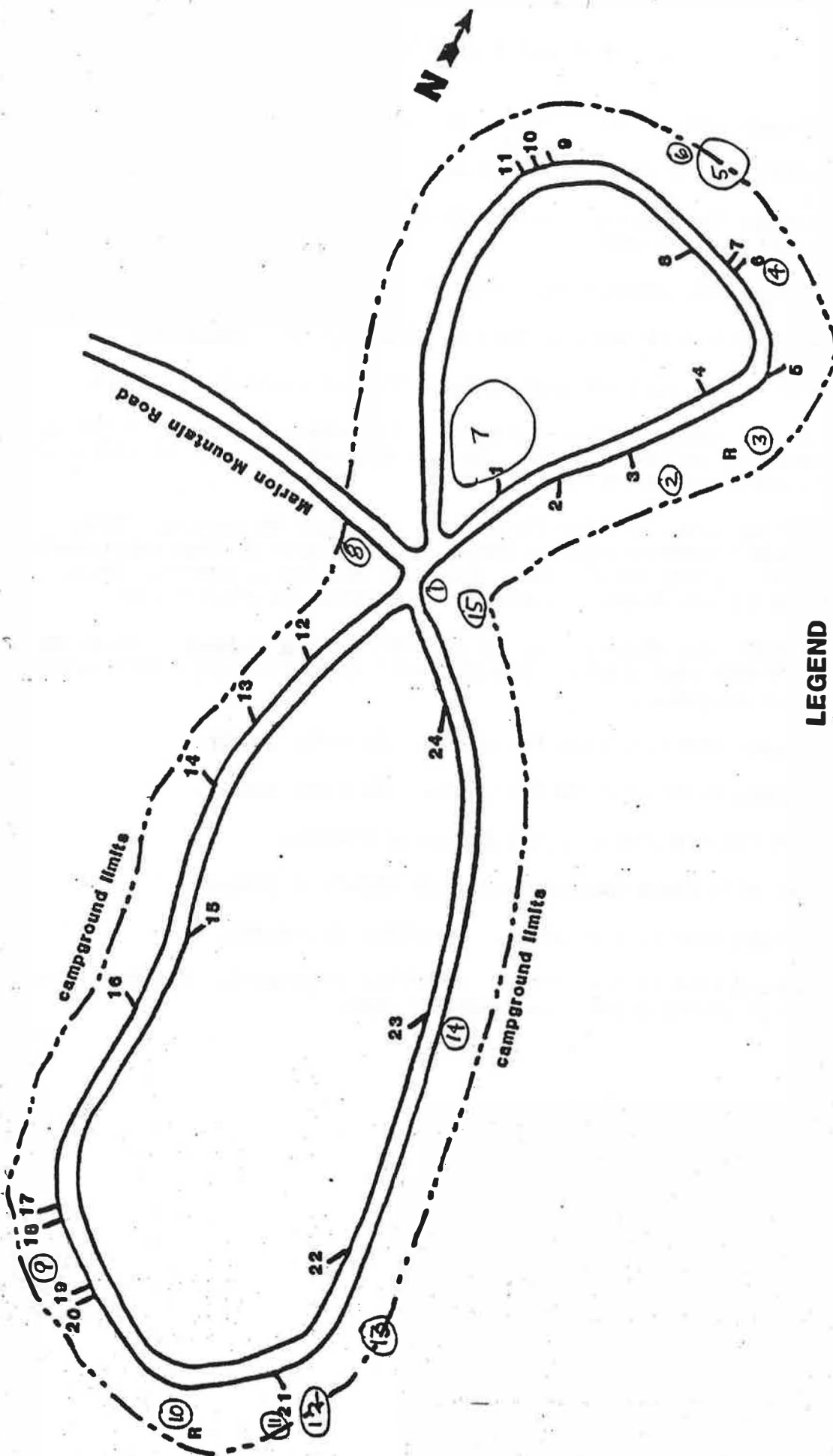
1. Do Nothing. Most of the overstory is slowly declining and it will continue to do so in the future. The rate of decline may accelerate as competition from young white fir increases or during a future drought. A few of the overstory trees such as white fir infected with annosus root disease or pines with red-brown butt rot could snap off or uproot while still green. Most of the current understory is not likely to develop into a long-lived overstory because the pine has generally been suppressed for many years and the fir is subject to several diseases as well as being generally short-lived on the site. In the

absence of management, or a natural disaster which prepares a good seed bed and fortuitously coincides with a good seed year, the future stand will probably be much sparser than the current one.

2. Thin. Thinning around some of the overstory trees could extend their lives for several decades, although they will eventually have to be replaced. There are also a few pockets of smaller diameter pine which might provide some replacement trees if selected individuals were free to grow. Thinning will probably have to be repeated as trees grow or seed into the campground. Thinning is a biologically sound method of solving several problems in the campground. Stumps of all freshly cut conifers in the campground should be treated with borax (sodium tetraborate decahydrate, EPA Reg. No. 1624-94) to prevent infection by F. annosus (See FSM R-5 Suppl. No. 90, 2305 and 2331.33).

3. Plant. Planting or transplanting of native trees and shrubs seems to be the only way of insuring that the stand will be perpetuated. Survival is likely to be low, however protection measures such as fencing and staking the trees as well as supplemental watering and a public education program involving signing the area may improve success. Some care should be exercised during the design of a planting program to avoid placing new vegetation in locations where it will stress overstory trees which are desirable to retain.

MARION MOUNTAIN CAMPGROUND



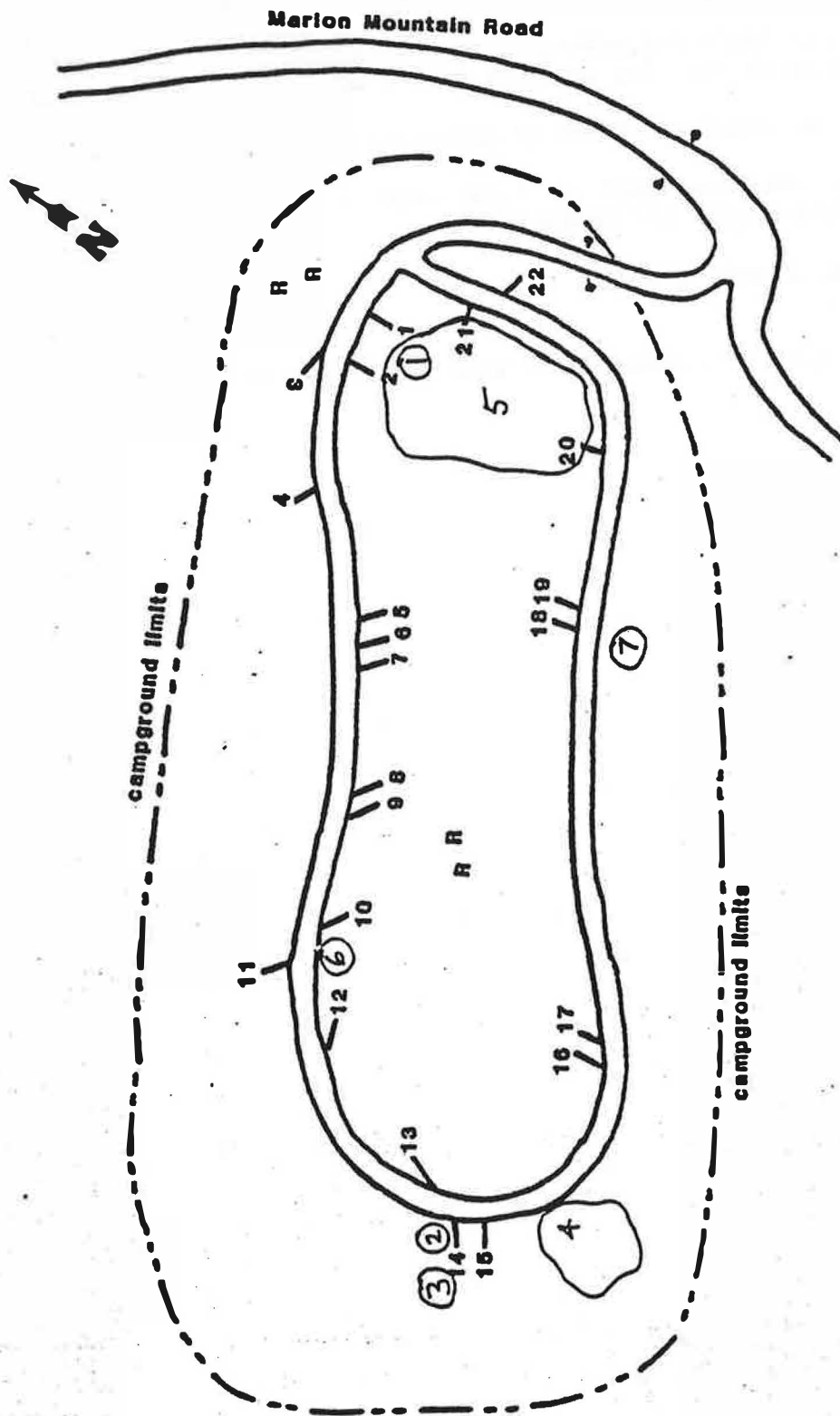
LEGEND

R RESTROOM

MARION MOUNTAIN CAMPGROUND NOTES

1. Fomes annosus conks in pine stump. No effect at present.
2. Fomes annosus conks in sugar pine stump. No effect at present.
3. Fomes annosus conks in white fir stump in opening. Nearby white fir saplings not growing well.
4. Area of relatively dense, small white fir.
5. Large sugar pine with dwarf mistletoe. Isolated from campground.
6. Basal area of 440 sq.ft./a plus many 2-6 in. dbh white fir saplings.
7. Fomes annosus conks in white fir stumps in opening. A few white fir may be affected around edge in time. Opening planted with incense-cedar, good oak complement around opening.
8. Fomes annosus conks in white fir stump. No hazard at present. Thin, weak-crowned overstory pines present. Some old-growth pines surrounded by thickets of sapling and pole-size white fir and incense-cedar. Young growth sugar pines present in some areas as possible replacements.
9. Group of white fir stumps, some with decay by Fomes annosus. Callus on stumps indicate root grafts. Standing dead white fir with recent attack by Scolytus ventralis.
10. Fomes annosus conks in white fir stumps. No hosts nearby.
11. Fomes annosus conks in white fir stumps. No hosts nearby.
12. Dead white fir with old Scolytus ventralis attacks.
13. Pine stump with Fomes annosus conks. No effect at present.
14. Fomes annosus conk in pine stump. No effect at present.
15. Fomes annosus conk in pine stump. No effect at present. Evidence of past western pine beetle attacks in ponderosa pine.

FERN BASIN CAMPGROUND



LEGEND

- R RESTROOM
- ⬮ GATE

FERN BASIN CAMPGROUND NOTES

1. Fomes annosus conks in white fir stump. No effect at present.
2. Fomes annosus conks in white fir stump. No effect at present.
3. Area of white fir mortality with stumps of various ages and typical Fomes annosus decay. Two recently killed white fir with Scolytus ventralis.
4. Area of dwarf mistletoe in ponderosa pine just entering campground.
5. Very dense area (600 sq.ft./a) with suppressed understory. Extreme stress on predominant and dominant pines.
6. Fomes annosus conks in pine stump next to large opening. No threat at present.
7. Aggregate of incense-cedar with basal area of 440 sq.ft./a.